



Department of Electrical Engineering

Faculty Member: LE Munadi Sial
Semester: 7th

Date: 13-Sep-2023
Group:

CS471 Machine Learning

Lab 1: Introduction to Python

Name	Reg. No	PLO4 - CLO4	PLO4 - CLO4	PLO5 - CLO5	PLO8 - CLO6	PLO9 - CLO7
		Viva /Quiz / Lab Performance	Analysis of data in Lab Report	Modern Tool Usage	Ethics	Individual and Team Work
		5 Marks	5 Marks	5 Marks	5 Marks	5 Marks
Ali Khalid	336676					
Fatima Humayun	339732					
Mohammad Ahmad Hussain	314248					
Syeda Amna Naeem	340436					



Introduction

This laboratory exercise will introduce the fundamental aspects of the Python programming language which is a very popular language and used extensively in the area of Machine Learning.

Objectives

The following are the main objectives of this lab:

- Write and execute python code in Google Colaboratory (Colab)
- Create and use variables of different data types in python
- Use arithmetic and logical operations in python
- Implement conditional statements in python
- Implement WHILE and FOR loops in python
- Define and call functions in python

Lab Conduct

- Respect faculty and peers through speech and actions
- The lab faculty will be available to assist the students. In case some aspect of the lab experiment is not understood, the students are advised to seek help from the faculty.
- In the tasks, there are commented lines such as `#YOUR CODE STARTS HERE#` where you have to provide the code. You must put the code/screenshot/plot between the `#START` and `#END` parts of these commented lines. Do NOT remove the commented lines.
- Use the tab key to provide the indentation in python.
- When you provide the code in the report, keep the font size at 12



Theory

Python is an open-source, interpreted language which is widely used for machine learning tasks in research, academia and industry. It has an easy-to-learn syntax and is ideal for writing programs in a short duration. The python interpreter can be downloaded from the website and installed on the system. By default, the IDLE program is installed. For machine learning, it is recommended to switch to a more powerful IDE such as PyCharm, Spyder and Jupyter etc. For this lab, we will use Google Colab for writing python code. Google Colab is a cloud-based platform that allows you to write python code in your web browser and provides free access to computing resources such as GPUs.

A brief summary of the relevant keywords and functions in python is provided below:

print()	output text on console
input()	get input from user on console
range()	create a sequence of numbers
len()	gives the number of characters in a string
if	contains code that executes depending on a logical condition
else	connects with if and elif , executes when conditions are not met
elif	equivalent to else if
while	loops code as long as a condition is true
for	loops code through a sequence of items in an iterable object
break	exit loop immediately
continue	jump to the next iteration of the loop
def	used to define a function



Lab Task 1 _____ [2]

Write a program which evaluates the following three expressions for when $x = 1, 2, 3, 4$ and 5 .

$$4x^3 + 5x^2 + 3x + 2$$

$$\frac{3x^2 + 7x}{2} - \frac{2x}{5}$$

(a) Fill the following table with the answers:

	$x = 1$	$x = 2$	$x = 3$	$x = 4$	$x = 5$
Expression 1	14	60	164	350	642
Expression 2	4.6	12.2	22.8	36.4	53.0

(b) Provide the code for both expressions in the indicated regions:

EXPRESSION 1 CODE STARTS HERE

```
4*(x**3) + 5*(x**2) + 3*x + 2
```

EXPRESSION 1 CODE ENDS HERE

EXPRESSION 2 CODE STARTS HERE

```
4*(x**3) + 5*(x**2) + 3*x + 2
```



EXPRESSION 2 CODE ENDS HERE

Lab Task 2 _____ [1]

Write a program that reads in two integer inputs, then determines and prints if the first is a multiple of the second. To input a variable, use the following syntax:

`variable = input("prompt_message")`

Remember that the above function returns a string which is stored in the variable. You need to explicitly convert the string variable to an integer type using the `int()` casting. Provide the code and screenshot of the result.

TASK 2 CODE STARTS HERE

```
first_num = int(input("first number: "))
second_num = int(input("second number: "))

if ((first_num%second_num)==0):
    print("first number is a multiple of the second")
else:
    print("the first number is not a multiple of the second")
```

TASK 2 CODE ENDS HERE

TASK 2 SCREENSHOT STARTS HERE

```
PS U:\Semester7\CS471 Machine Learning\lab\1> python -u "u:\Semester7\CS471 Machine Learning\lab\1\task2.py"
first number: 10
second number: 5
first number is a multiple of the second
PS U:\Semester7\CS471 Machine Learning\lab\1> █
```



TASK 2 SCREENSHOT ENDS HERE

Lab Task 3 _____ [1]

Write a program that prompts the user for two numbers as input. Then, the program must compare the two numbers and print if they are equal or not. If the numbers are not equal, it must also print which number is greater (or lesser) than the other. The syntax for conditional statements is given as follows:

```
if condition:
    statement_1
else:
    statement_2
```

TASK 3 CODE STARTS HERE

```
first_num = input("enter first number ")
second_num = input("enter second number")

if (first_num == second_num):
    print("Both numbers are equal to each other")

if(first_num>second_num):
    print("first number is greater than the second number")

else:
    print("second number is greater than the first number")
```

TASK 3 CODE ENDS HERE

TASK 3 SCREENSHOT STARTS HERE



```
enter first number: 19
enter second number: 111
first number is greater than the second number
```

TASK 3 SCREENSHOT ENDS HERE

Lab Task 4 _____ [1]

Write a program that takes two numbers as inputs. Then, the program must compare the two numbers and print appropriately from among the following lines:

- Both numbers are positive
- Both numbers are negative
- Both numbers are zero
- At least one number is zero
- One number is positive and the other number is negative

TASK 4 CODE STARTS HERE

```
first_num = int(input("enter first number "))
second_num = int(input("enter second number"))

if((first_num<0) and (second_num < 0)):
    print("both numbers are less than zero")

if((first_num==0) and (second_num == 0)):
    print("both numbers are equal to zero")

if((first_num==0) or (second_num == 0)):
    print("at least one of the number is equal to zero")

if((first_num<0)or (second_num<0)) and ((second_num>0) or (first_num>0)):
    print("one nnumber is positive and the other number is negative")
```



```
else:  
    print("numbers are positive")
```

TASK 4 CODE ENDS HERE

TASK 4 SCREENSHOT STARTS HERE

```
PS U:\Semester7\CS471 Machine Learning\lab\1> python -u "u:\Semester7\lab\1\task4.py"  
enter first number: 10  
enter second number: -19  
one number is positive and the other number is negative  
PS U:\Semester7\CS471 Machine Learning\lab\1>
```

TASK 4 SCREENSHOT ENDS HERE

Lab Task 5 _____ [1]

Write a program that calculates the factorial of a number. To calculate the factorial, you will need to make use of a *while* loop. The syntax of the while loop is given as follows:

```
while condition:  
    statement_1  
    statement_2
```

TASK 5 CODE STARTS HERE

```
def factorial(num):  
  
    sum = 1  
    while (num > 0):  
        sum = sum * num
```




```
num = num - 1

return sum

print(f"the factorial of 3 is {factorial(3)}")
```

TASK 5 CODE ENDS HERE

TASK 5 SCREENSHOT STARTS HERE

```
PS U:\Semester7\CS471 Machine Learning\lab\1> python -u "u:\Semester7\CS471 Machine Learning\lab\1\task5.py"
the factorial of 3 is 6
```

TASK 5 SCREENSHOT ENDS HERE

Lab Task 6 _____ [1]

Write a function that takes 2 integer arguments and returns their product but you must **NOT** use the product operator (*). You will need to provide the function definition and the function call. (Hint: You need to make use of loops in your function.) The function definition syntax is given below:

```
def function_name:
    statement_1
    statement_2
    ...
    return output
```

TASK 6 CODE STARTS HERE

```
def mul(num1, num2):
    while(num2>0):
        sum = int()
```



```
while(num2>0):  
    sum = sum + num1  
    num2 = num2 - 1  
  
return sum  
  
num1 = 5  
num2 = 6  
  
print(f"multiplying {num1} and {num2} results in {mul(num1,num2)}")
```

TASK 6 CODE ENDS HERE

TASK 6 SCREENSHOT STARTS HERE

```
PS U:\Semester7\CS471 Machine Learning\lab\1> python -u "u:\Semester7\CS471 Machine Learning\  
ab\1\task6.py"  
multiplying 5 and 6 results in 30
```

TASK 6 SCREENSHOT ENDS HERE

Lab Task 7 _____ [1]

Write a program that prompts the user for 3 strings variables. The user will input the strings separately at the prompt, e.g. "TRI", "GONO" and "METRY". The strings will then be passed to a function as arguments. The function must use a *for* loop to iterate through the characters and print each character on a new line. The function must also print the total number of characters in the final string. For this, you can use the `len()` function. Note that the "TRIGONOMETRY" string is just an example and you need to use your own string for the submission. You also need to take screenshot of this task showing the entire output. The for loop syntax is given as follows:



for index **in** iterable:
 statement_1
 statement_2

TASK 7 CODE STARTS HERE

```
str1= input("first string: ")
str2= input("second string: ")
str3= input("third string: ")

count = 0
for i in str1:
    count = count + 1
    print(i)

for j in str2:
    count = count + 1
    print(j)

for k in str3:
    print(k)
    count = count+1

print("total length of all the strings is: ", count)
```

TASK 7 CODE ENDS HERE

TASK 7 SCREENSHOT STARTS HERE



```
first string: trig
second string: nom
third string: etry
t
r
i
g
n
o
m
e
t
r
y
total length of all the strings is: 11
```

TASK 7 SCREENSHOT ENDS HERE

Lab Task 8 _____ [1]

Write a program that generates the following number sequences and print the output. You can use the range() function for this task. Use a loop to invoke the range function iteratively.

1, 2, 3... 20
2, 4, 6... 40
3, 6, 9... 60
4, 8, 12 ... 80
...
10, 20, 30... 200

TASK 8 CODE STARTS HERE

```
for k in range(1,11):
    for i in range(1,21):
        print(i*k,end=" ")
    print(" ")
```



TASK 8 CODE ENDS HERE

TASK 8 SCREENSHOT STARTS HERE

```
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40
3 6 9 12 15 18 21 24 27 30 33 36 39 42 45 48 51 54 57 60
4 8 12 16 20 24 28 32 36 40 44 48 52 56 60 64 68 72 76 80
5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100
6 12 18 24 30 36 42 48 54 60 66 72 78 84 90 96 102 108 114 120
7 14 21 28 35 42 49 56 63 70 77 84 91 98 105 112 119 126 133 140
8 16 24 32 40 48 56 64 72 80 88 96 104 112 120 128 136 144 152 160
9 18 27 36 45 54 63 72 81 90 99 108 117 126 135 144 153 162 171 180
10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200
```

TASK 8 SCREENSHOT ENDS HERE